

# Evaluating Lower Tropospheric Ozone Simulations Using GOME/SCIAMACHY/OMI Observations of $\text{NO}_2$ and HCHO

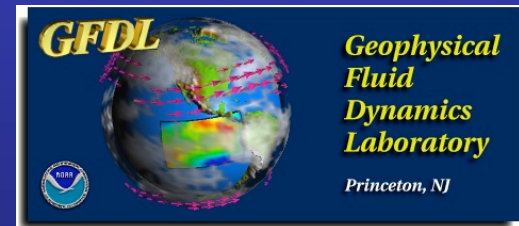
Randall Martin  
Aaron Van Donkelaar



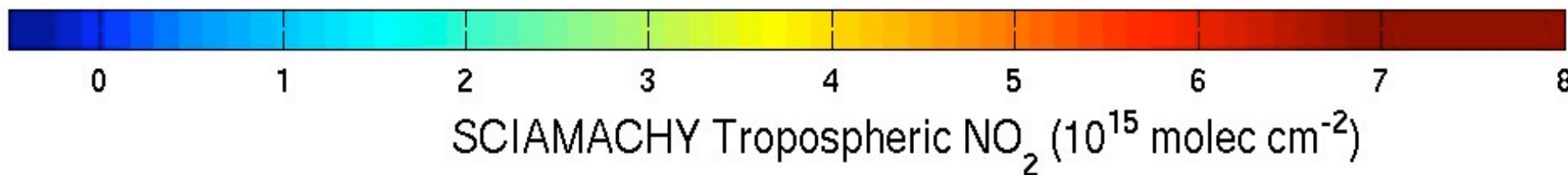
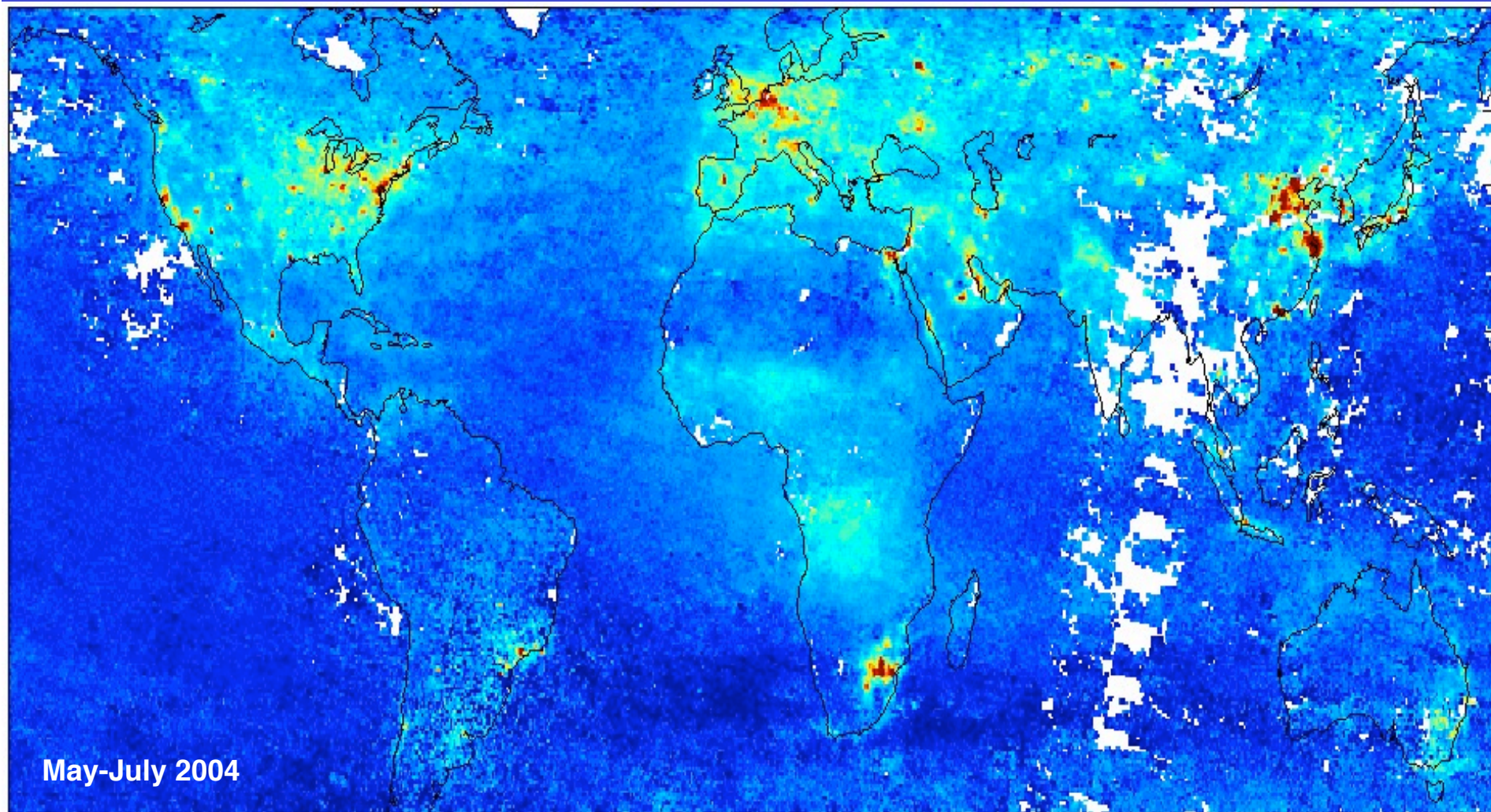
Chris Sioris  
Kelly Chance



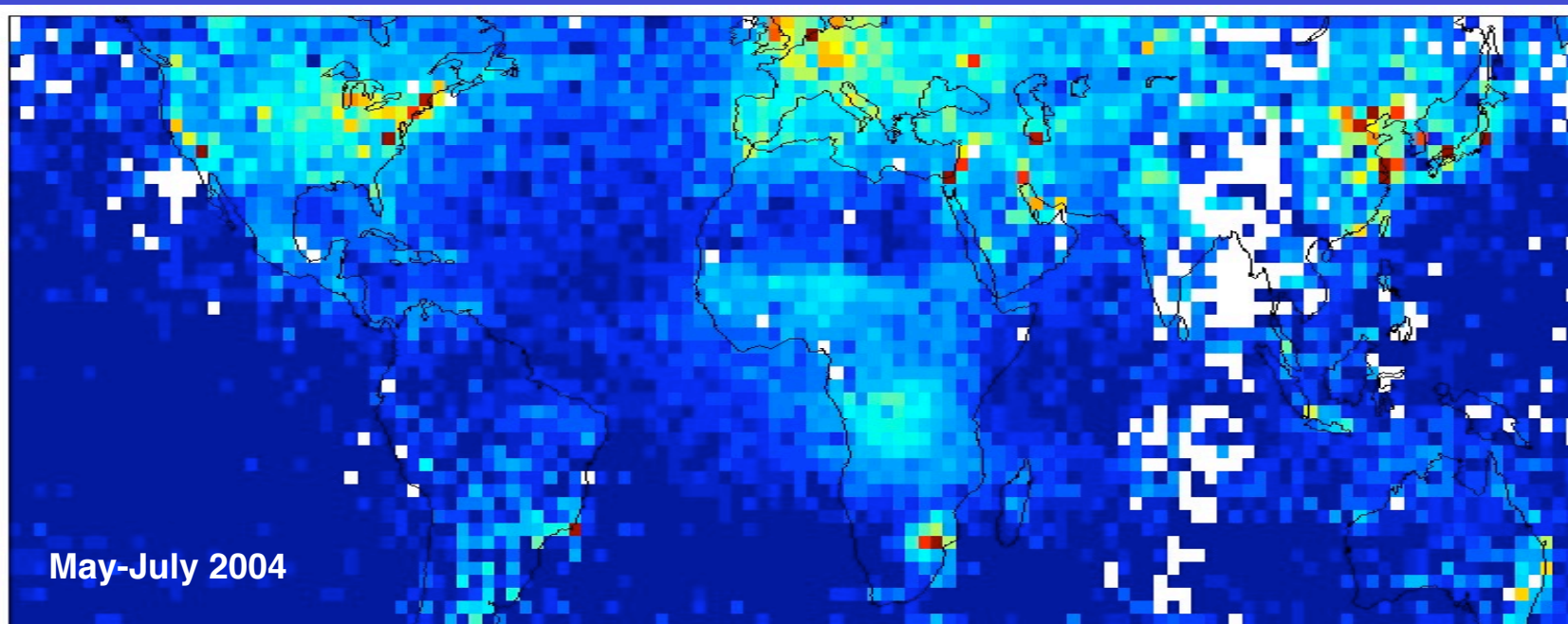
Arlene Fiore



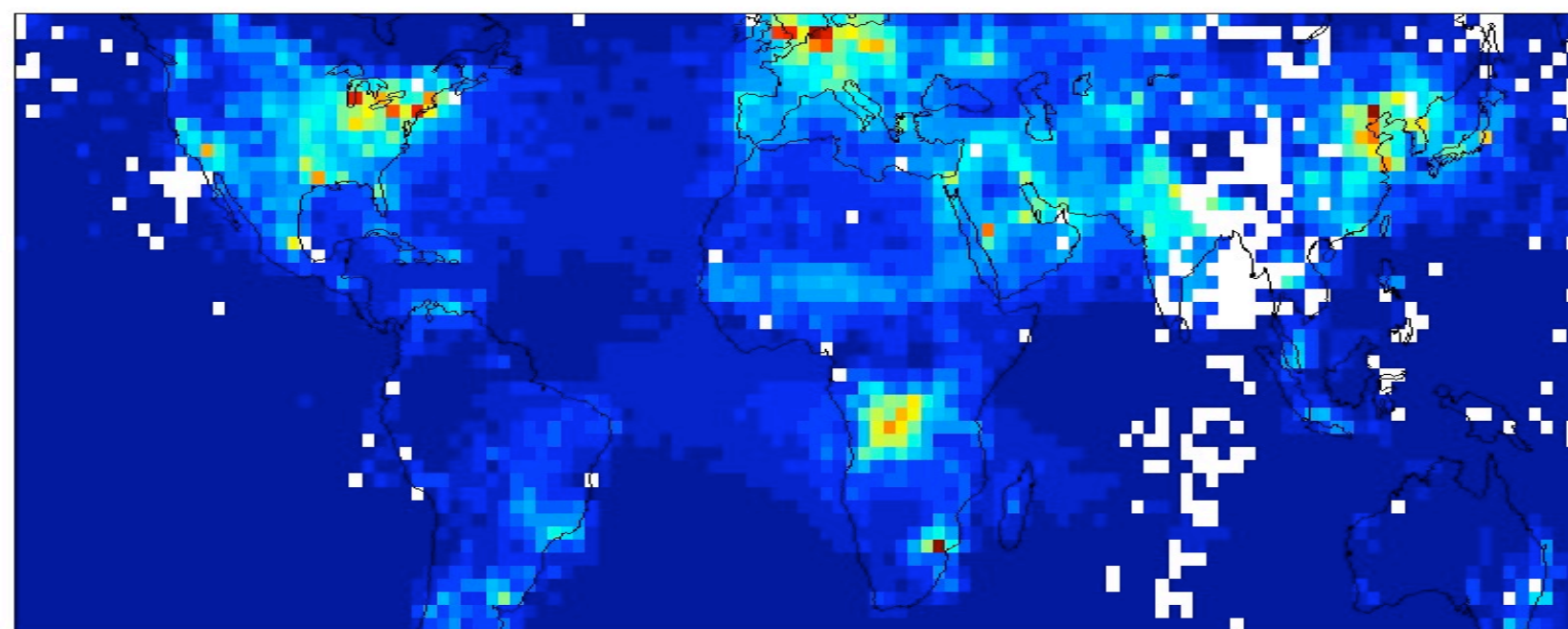
## SCIAMACHY Tropospheric NO<sub>2</sub> Columns



# Tropospheric NO<sub>2</sub> Columns Evaluate NO<sub>x</sub> Emissions

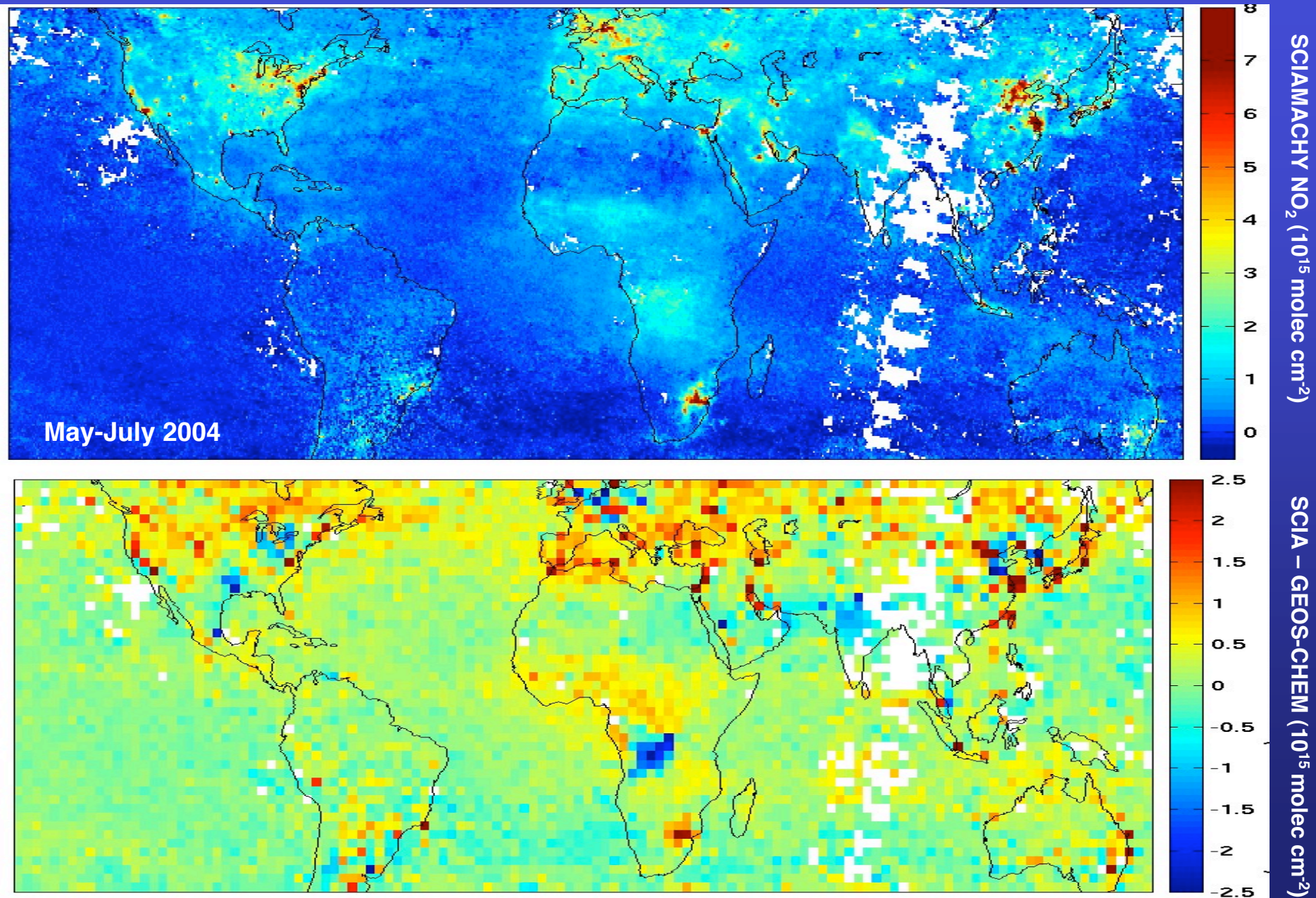


SCIAMACHY NO<sub>2</sub> (10<sup>15</sup> molec cm<sup>-2</sup>)

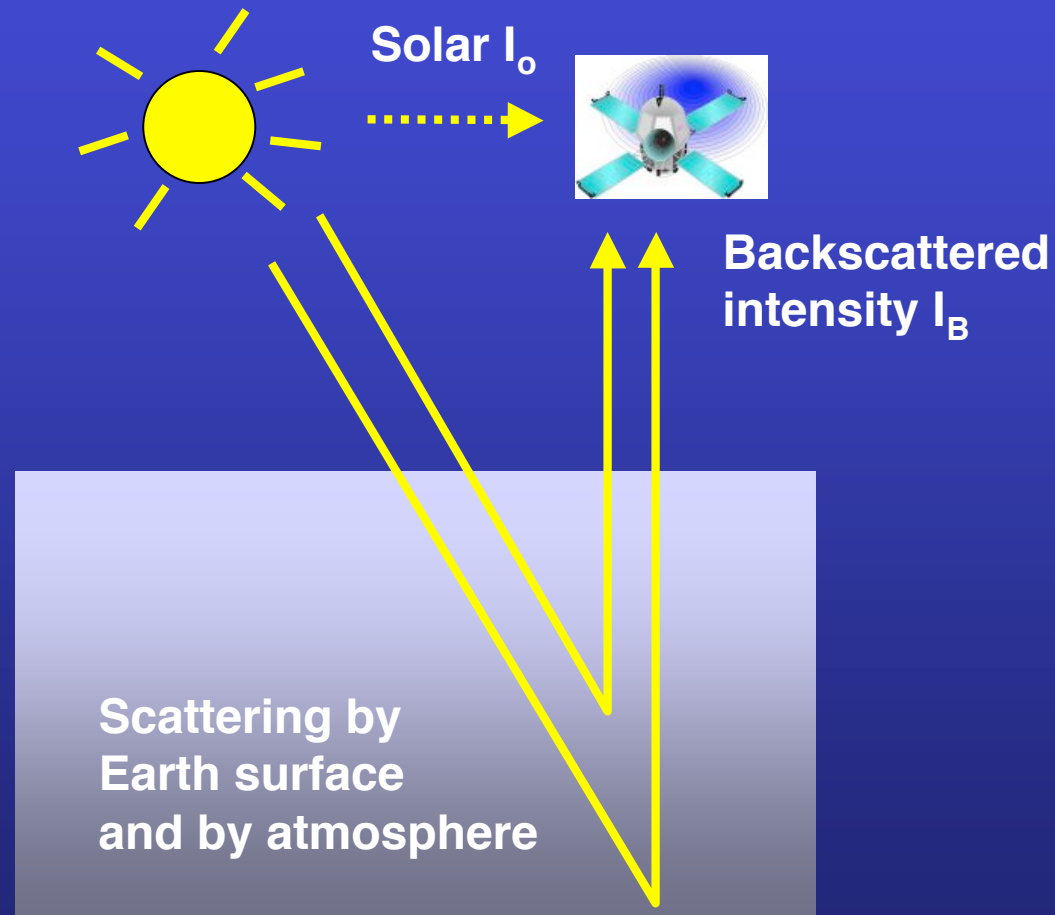


GEOS-CHEM NO<sub>2</sub> (10<sup>15</sup> molec cm<sup>-2</sup>)

# Significant Model/Measurement Differences Exist



# Errors in the $\text{NO}_2$ and $\text{HCHO}$ Retrievals from Aerosols, Clouds, Surface Reflectivity Largely Cancel in their Ratio

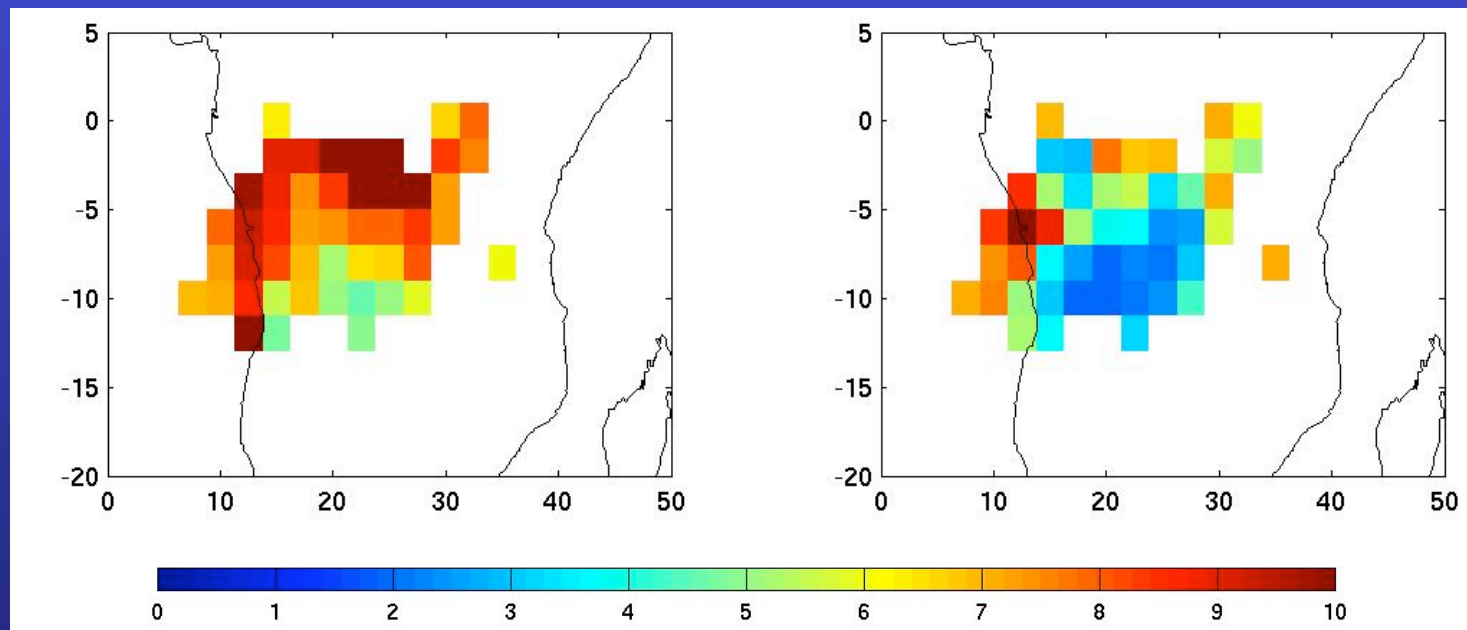


# HCHO/NO<sub>2</sub> Column Ratio Consistent with Model Overestimate of NO<sub>x</sub> Emissions from Biomass Burning

GOME

GEOS-CHEM

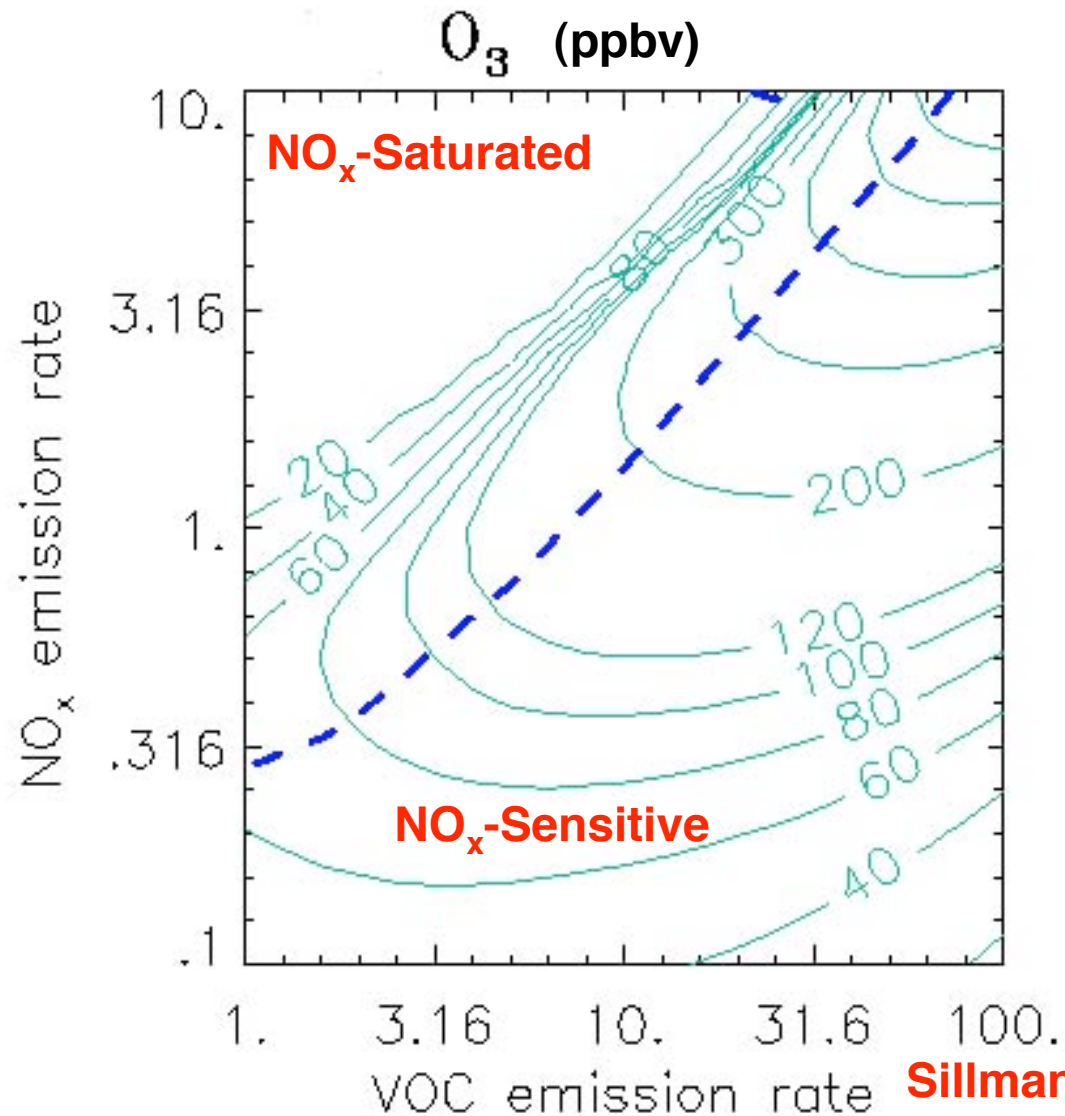
JULY  
1997



Tropospheric HCHO/NO<sub>2</sub> Column Ratio

# HCHO/NO<sub>2</sub> Ratio is Also An Interesting Indicator

HCHO/NO<sub>y</sub> Ratio Used as Indicator  
Would like to Observe from Space...

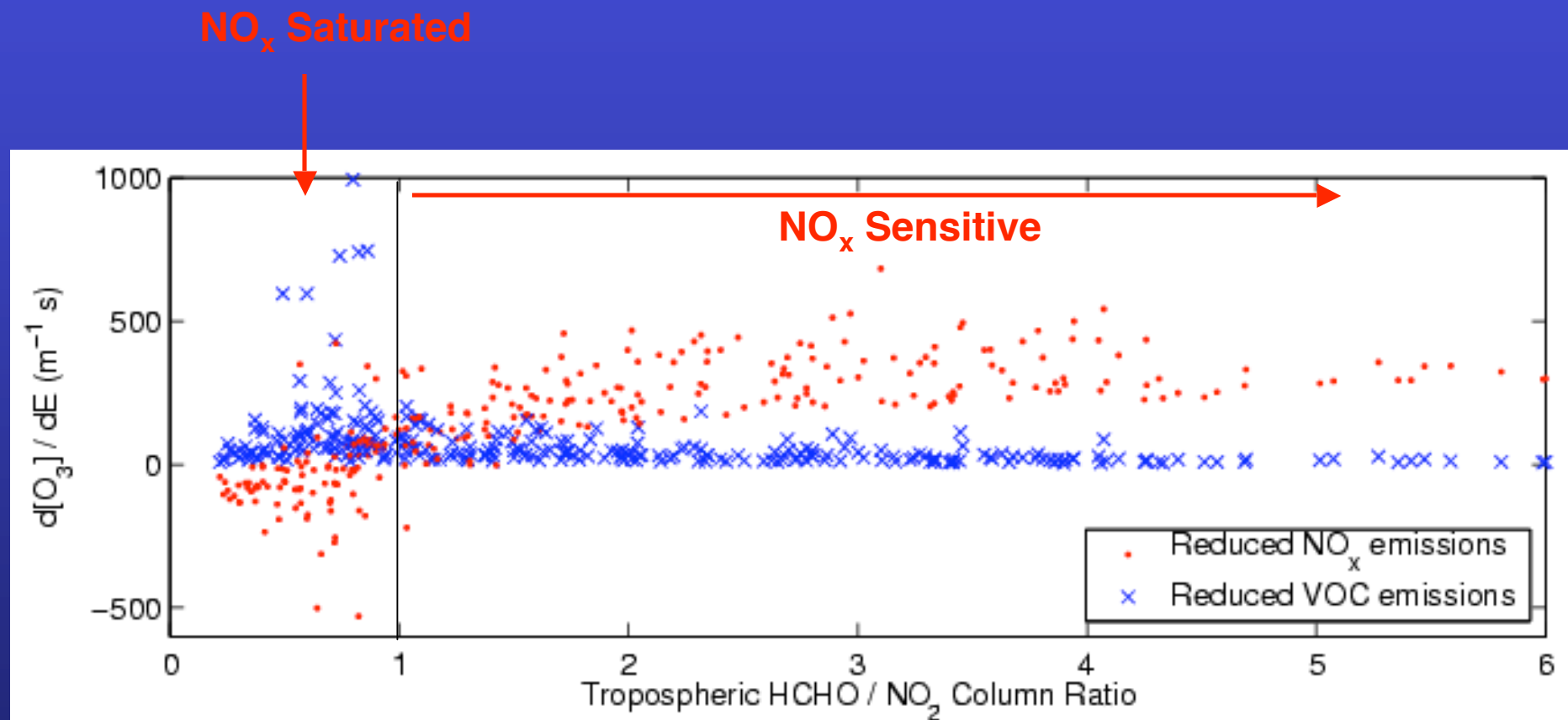


Sillman and He, 2002

## **Conduct Three Simulations With GEOS-CHEM CTM to Diagnose Quality of HCHO/NO<sub>2</sub> Column Indicator**

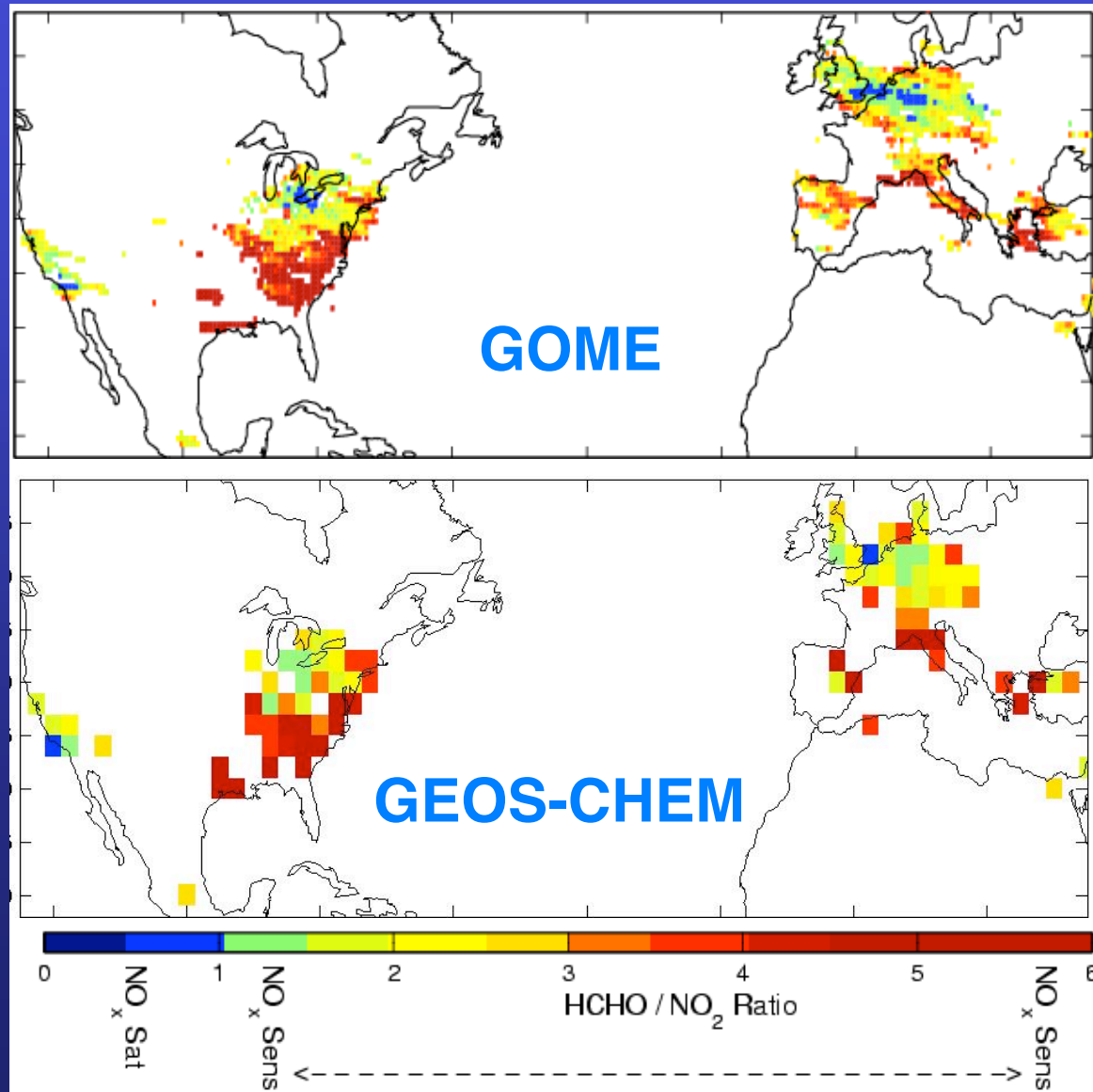
- **Base Case**
- **Reduce Anthropogenic NO<sub>x</sub> Emissions by 50%**
- **Reduce Anthropogenic VOC Emissions by 50%**

**Tropospheric HCHO/NO<sub>2</sub> Column Ratio Is an Indicator of the Sensitivity of  
Afternoon Surface Ozone to NO<sub>x</sub> and VOC Emissions**  
GEOS-CHEM Model Calculation For Polluted Regions, Mar-Nov



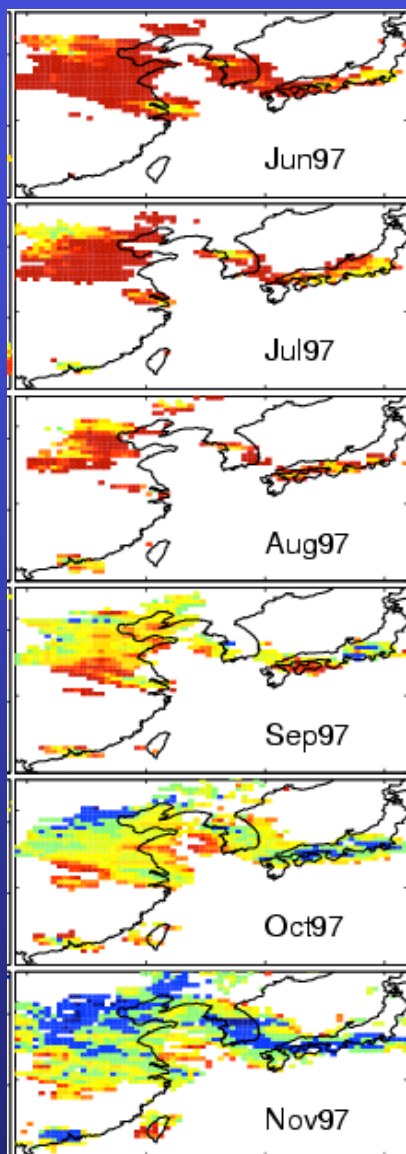
# **NO<sub>x</sub>-Sensitive Conditions Over Most Polluted Regions During August**

**Major Industrial Areas are Clear Exceptions**



# Seasonal Progression from NO<sub>x</sub>-Sensitive to NO<sub>x</sub>-Saturated Conditions

GOME



More Frequent  
Ozone Episodes  
in Fall

GEOS-CHEM

